



## ZCAS University

CCS1601 – IOT FUNDAMENTALS: CONNECTED THINGS

END OF SEMESTER EXAMINATION

FRIDAY, 2<sup>nd</sup> JUNE 2023

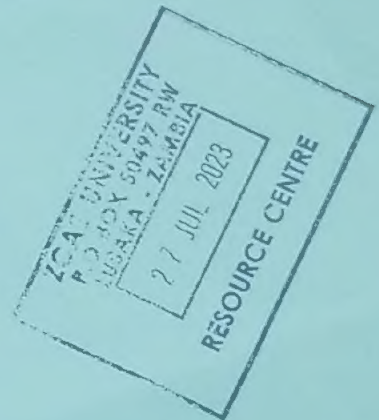
12:30 HRS-15:30HRS

TIME ALLOWED: WRITING – THREE HOURS

READING – 5 MINUTES

### INSTRUCTIONS:

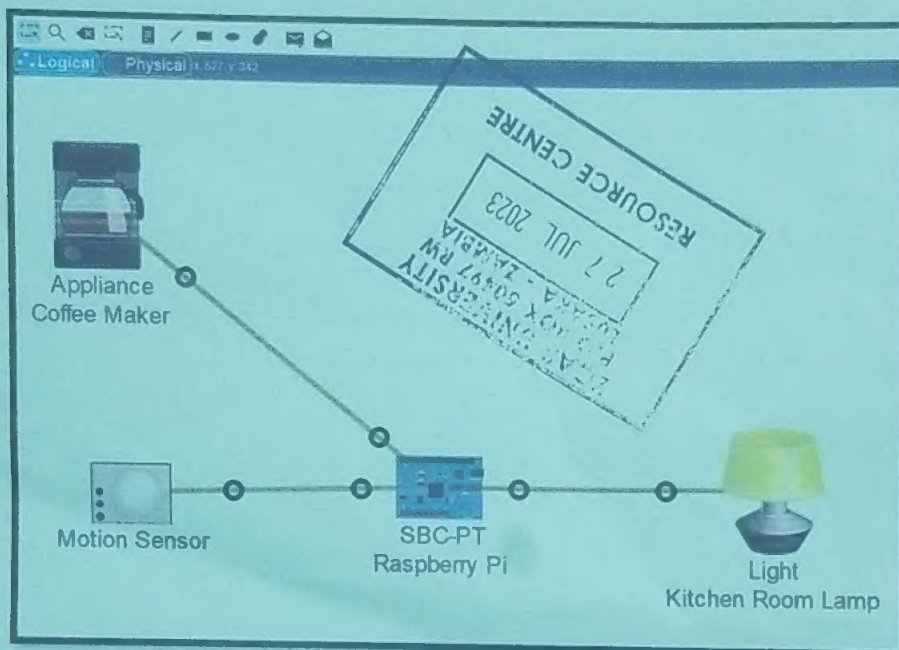
1. Section A: this question is **compulsory** and must be attempted.
2. Sections B: Answer **THREE (3)** questions from this section.
3. This examination paper carries a total of **100 marks**.
4. Candidates must **not turn this page** until the invigilator tells them to do so.



## SECTION A: Question 1 is compulsory and must be attempted

### Question 1

Python is wide-spread, robust and easy to program language that runs on several different computer platforms. Cisco Packet Tracer takes advantage of this and implements Python-supported IoT devices. The figure below shows a simple implementation of IoT in Packet Tracer.

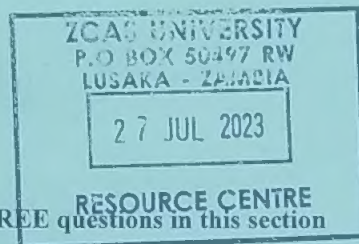


In the figure above, the goal is to allow a coffee maker to start brewing coffee when someone enters the kitchen (movement is detected). A countertop kitchen lamp will also turn on. As fresh graduate from ZCAS University, you have been asked to implement this simple IoT set up. Answer the following questions:

- Define two (2) main roles of the Raspberry Pi in this set up? **[4 Marks]**
- Write Python code that will import the gpio and time modules into the program. **[4 Marks]**
- Using Python, write the function called main() with the following requirements:
  - Define the while loop which will run forever. **[2 Marks]**
  - Declare a variable called motion\_sensor that reads the digital signal from pin 9 (signal from the PT-Motion Detector) and stores it in the variable. PT-Motion Detector sends HIGH or LOW to inform movement or no movement, respectively. The digital signal function to use is digitalRead() that accept signal. **[2 Marks]**
  - Tests the contents of the motion\_sensor variable. If it equals HIGH (there's movement), then programme executes the other statements. **[2 Marks]**
  - Write code that print messages to the Python console with the following messages: **[4 Marks]**  
"FirstName is awake" (FirstName is your first name)  
"LastName is now making coffee" (LastName is your last name)



- v. Write code that send the digital value of 1 to the digital pins 1 and 2. These pins are connected to the PT-Coffee Maker and PT-Light, respectively. This will turn on the two devices. Use the function customWrite(). [4 Marks]
- vi. Write code that forces the interpreter to wait for 6000 milliseconds (6 seconds) using appropriate function. [4 Marks]
- vii. Write code that print other messages on the Python console afterwards as follows: [4 Marks]  
 "Done. Coffee is ready."  
 "Drink and Go to Class."
- viii. Write code that will send digital signal of 0 to digital pins 1 and 2. These pins are connected to the PT-Coffee Maker and PT-Light, respectively. This will turn off the two devices. [4 marks]
- ix. Write a code that forces the interpreter to wait for 500 milliseconds (0.5 seconds) using appropriate function. [4 Marks]
- d) Write Python code that will call Packet Tracer's Python interpreter to run the main() function. [2 Marks]



(Total: 40 marks)

**SECTION B: Attempt any THREE questions in this section**

**Question 2**

Answer the following questions justifying your answer [2 Marks each]. **NOTE, YOU GET HALF MAKE FOR CORRECT ANSWER WITHOUT JUSTIFICATION, YOU GET NEGATIVE (-1) FOR WROTE ANSWER AND ZERO (0) FOR "I don't Know":**

- i. Which of the following takes electrical input and transform the input into physical action.  
 A. Controllers      B. Sensor      C. Actuator      D. I dont Know
- ii. Which of the following is not based on electromagnetic transmission?  
 A. Coaxial      B. WiFi      C. LTE - 4G      D. I dont Know
- iii. Which of the following software is not created using a programming language?  
 A. System      B. Application      C. None of the two provided      D. I dont Know
- iv. Variables only represent characters in Python.  
 A. True      B. False      C. I dont Know
- v. All programs in Pythen should include a condition statement.  
 A. True      B. False      C. I dont Know
- vi. A program without a loop is not a valid Python program.  
 A. True      B. False      C. I dont Know
- vii. Which of the following is not a Philosophy of Python programing language?

- A. Beautiful is better than ugly
- C. Complex is better than complicated
- E. I dont Know

- B. Explicit is better than implicit
- D. Readability does not count

viii. All functions an Arduino can do, Rasberry PI will do it better.

- A. True
- B. False
- C. I dont Know

ix. Which of the following refer to data about data?

- A. Metadata
- B. IoTdata
- C. Digitaldata
- D. I dont Know

x. Which of the following is an example of an actuator?

- A. Solenoid
- B. Schematic
- C. Potentiometer
- D. I dont Know

(20 marks)

### Question 3

- a) Spathiphyllum, more commonly known as a peace lily or white sail plant, is one of the most popular indoor houseplants that filters out harmful toxins from the air. Some of the toxins that it neutralizes include benzene, formaldehyde, and ammonia. Imagine that your computer program loves these plants. Whenever it receives an input in the form of the word Spathiphyllum, it involuntarily shouts to the console the following string: "Spathiphyllum is the best plant ever!". Write a program that utilizes the concept of conditional execution, takes a string as input, and: prints the sentence "Yes - Spathiphyllum is the bestplant ever!" to the screen if the inputted string is "Spathiphyllum" (upper-case -s), prints "No, I want a big Spathiphyllum!" if the inputted string is "spathiphyllum" (lower-case) and prints "Spathiphyllum! Not [input]!" otherwise. Note: [input] is the string taken as input. [10 Marks]
- b) Discuss the three (3) building blocks of IoT Systems. [6 Marks]
- c) What are the two (2) main differences between OSI and TCP/IP models. [4 Marks]

(20 marks)

### Question 4

Determine whether the following is True or False and justify your answer [2 Marks each]:

- a) If your code used the '+' operation, Python automatically translate it to binary.
- b) Multithreading is very easy to program in Python.
- c) Modules written in Python 2 can be executed in Python 3 without any modification.
- d) If you add 12 and 12.0 the answer will be 24.
- e) If you subtract 2 from 2.0 the answer will be 0.
- f) When a variable stored from the input function is used directly in the calculation of integers will cause an error.
- g) When a variable stored from the input function is used directly in addition involving strings will cause an error.



- h) Software must be written and uploaded onto ALL IoT devices to allow them to make decisions.
- i) The Raspberry Pi can be used to get real time data from IoT devices.
- j) The Packet Tracer MCU simulates an SBC such as a Raspberry Pi.

(20 marks)

### Question 5

A junior magician has picked a secret number. He has hidden it in a variable named `secret_number` (e.g 78). He wants everyone who runs his program to play the *Guess the secret number* game and guess what number he has picked for them. Those who don't guess the number will be stuck in an endless loop forever! Unfortunately, he does not know how to complete the code.

Your task is to help the magician come up with the code in Python in such a way so that the code:

- a) will ask the user to enter an integer number; [2 Marks]
- b) will use a while loop to check whether the number entered by the user is the same as the number picked by the magician. If the number chosen by the user is different than the magician's secret number, the user should see the message "Ha ha! You're stuck in my loop!" and be prompted to enter a number again. If the number entered by the user matches the number picked by the magician, the number should be printed to the screen, and the magician should say the following words: "Well done, muggle! You are free now." [18 marks]

(20 marks)

END OF EXAMINATION

